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$$m\int_0^a s\,dx+m\int_0^b\left(s-\frac{p}{b}y\right)dy+m\int_0^c\left(s-\frac{p}{c}z\right)dz=0.$$

$$\therefore\ (a+b+c)s=\tfrac{1}{2}p(b+c).\quad \therefore\ s=\frac{p(b+c)}{2(a+b+c)}.$$

Hence the distance of the center of force from the side a is $\frac{p(b+c)}{2(a+b+c)}$.

In like manner it may be shown that its distance from the side b is $\frac{q(a+c)}{2(a+b+c)}$, and that its distance from the side c is $\frac{r(a+b)}{2(a+b+c)}$, when q and r are the altitudes of the triangle upon the sides b and c respectively.

Also solved by *G. B. M. ZERR*. His solution will appear in the next issue.

45. Proposed by H. C. WHITAKER, A. M., Ph. D., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.

A fifty-pound cannon-ball is projected vertically upward with a velocity of 300 feet per second. Find the height to which it will rise and the time of flight, assuming the initial resistance of the air on the ball to be 10 pounds and the resistance to vary as the square of the velocity.

Solution by G. B. M. ZERR, A. M., Ph. D., Texarkana, Arkansas.

Let h=height required, t=time of ascent, t_1=time of descent, $T=t+t_1$= time of flight, v=velocity=300 feet per second. W=50 pounds, g=32.2 feet per second. $\mu v^2=10$ pounds$=\frac{1}{5}W$.

$$\therefore\ \mu=\frac{W}{5v^2}.\quad \frac{1}{k}=\sqrt{\frac{W}{\mu}}=v\sqrt{5}.\quad \therefore\ k=\frac{1}{v\sqrt{5}}.$$

From Bowser's Analytical Mechanics, pages 306-7, we get,

$$h=\frac{1}{2gk^2}\log(1+k^2v^2),\quad t=\frac{1}{gk}\tan^{-1}vk.$$

$$t_1=\frac{1}{gk}\log\{\sqrt{1+v^2k^2}+vk\}.$$

$$\therefore\ h=\frac{5v^2}{2g}\log(\tfrac{6}{5})=1273.9827\text{ feet.}$$

$$t=\frac{v\sqrt{5}}{g}\tan^{-1}\frac{1}{\sqrt{5}}=8.75931\text{ seconds.}$$

$$t_1=\frac{v\sqrt{5}}{g}\log\left(\frac{\sqrt{6}+1}{\sqrt{5}}\right)=9.03118\text{ seconds.}$$

$$T=t+t_1=17.79049\text{ seconds.}$$

Also solved by *HENRY HEATON*.